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ABSTRACT

The material contained in this annotated resource list is intended to provide information upon which decisions about teaching thinking can be made, not to recommend or point to a particular path. The sources are organized around four groups of questions frequently asked by those responsible for making such decisions: (1) What are the components of thinking? (2) What programs are available to teach thinking? (3) What are some resources and publications devoted to thinking? and (4) Why teach thinking? and How can thinking be taught? The 16 sources include journal articles and monographs from 1984 through 1986, and an insert charts the components included in 23 different programs available to teach thinking. A list of periodicals which deal with the teaching of thinking and descriptions of two videotapes are included. (RS)

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Linking R&D to Practice

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Teaching for Thinking

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An Annotated Resource List

When the term "thinking" is mentioned, different people hear different things, depending on their discipline or point of view. Thinking can include problem solving, creativity, decision making, higher order thinking skills, critical thinking, intelligence, and on and on. Much of the work being done separates analytical thinking and creativity. While there is a relationship between the two, few of the "thinkers" in the field have concentrated on bridging the gap between them. Both kinds of thinking—convergent and divergent—are needed to deal with the complex world in which we live and function.

Various experts in the field look at thinking differently. Some believe thinking has a value or ethical dimension, others see it as processing information, and still others look for fluency, flexibility, originality, and elaboration as signs of thinking skills in action. Some make a distinction between tacit and practical knowledge. Others examine the nature of critical thinking and how it differs from a "skills" approach. Each "thinker" uses his/her approach to measure thinking and to develop programs to encourage the use of thinking skills.

While this seeming confusion may frustrate those practitioners who want to know that they are "doing the right thing" to help students become effective thinkers, it is only fitting that the quest for thinking start from a multi-dimensional perspective. Since that search for clarity is inherent in thinking, the process of deciding what it is and how to do it, see it, and measure it becomes an integral part of any program. As Arthur Costa says, "That makes the process consistent with the product."

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Another decision in this process is determining the extent to which one will teach of thinking, about thinking, or for thinking (Costa, 1985). "Of" thinking refers to the teaching of specific thinking skills, such as classifying, inferring, comparing/contrasting. Teaching "about" thinking involves metacognition, or one's ability to think objectively about one's own thinking processes, evaluate, and improve them. Finally, teaching "for" thinking means creating a climate in schools and classrooms that is conducive to the teaching of thinking and that supports the engagement of teachers and students in the practice of good thinking.

The sudden interest in the teaching of thinking stems from three sources: 1) a concern about declining test scores and studies that indicate a limited amount of time being devoted to encouraging and developing thinking; 2) a long-held (since Plato, Aristotle, or at least John Dewey) belief that the goal of education is the development of capable thinkers; and 3) a concern that the demands of future societies, if not present ones, require effective thinkers and problem solvers.

The material contained in this annotated resource list is intended to provide information upon which decisions about teaching thinking can be made, not to recommend or point to a particular path. We have organized resources around four groups of questions frequently asked by those responsible for making such decisions:

- **What are the components of thinking?**
- **What programs are available to teach thinking?**
- **What are some resources and publications devoted to thinking?**
- **Why teach thinking? How can thinking be taught?**

In addition an insert charts the components included in a variety of programs available to teach thinking.

The information needs to be discussed and synthesized by those responsible for enhancing student thinking before determining how any program is to be developed or implemented. While many commercial programs are available, a random adoption of any one would almost certainly ensure frustration and failure, since thinking itself would have been denied in the process. The resources are bountiful. All we have to do is THINK!

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What are the components of thinking?

Beyer, Barry K. "Critical Thinking: What Is It?" ***Social Education*****, April, 1985.**

After saying what critical thinking is not, Beyer says that "specialists today appear to agree that critical thinking is the assessing of authenticity, accuracy and/or worth of knowledge, claims and arguments." Critical thinking "involves careful, precise, persistent and objective analysis of any knowledge claim or belief to judge its validity and/or worth." He describes two phases to critical thinking, attitudinal and operational.

Identifying the attributes of each critical thinking skill is necessary for teaching them. The author sees three kinds of attributes: procedures, criteria, and rules. He outlines a six-step process: 1) state the goal or purpose of the analysis; 2) identify the clues; 3) search the data; 4) identify the pattern; 5) match the clues and perceived patterns with the ideal standards; 6) determine the extent to which data being examined match the ideal set of standards/ criteria.

Norris, Stephen P. "Synthesis of Research on Critical Thinking." ***Educational Leadership*****, May, 1985.**

The author defines critical thinking as "rationally deciding what to do or believe." He discusses research related to the following statements about critical thinking:

1) Critical thinking is an educational ideal and a moral right.

2) Critical thinking ability is not widespread.

3) Teachers should look for the reasoning behind students' conclusions.

4) Simple errors may signal errors in thinking at a deeper level.

5) Having a critical spirit is as important as thinking critically.

6) To think critically, one must have knowledge.

7) We do not know a great deal about the effect of teaching critical thinking.

Renzulli, Joseph S. and Sally M. Reis. "Scope and Sequence Approach to Process Development." ***G/C/T*****, March/April, 1985.**

This article discusses Type II Enrichment of the Enrichment Triad Model. The objectives of the model include developing general and specific skills in creative thinking, problem solving, critical thinking, decision making, and affective processes (sensing, appreciating, valuing); developing how-to-learn skills; developing the appropriate use of advanced-level reference materials; and developing written, oral, and visual communication skills. The system is based on intellectual and process development. The taxonomy helps in setting program objectives and selecting materials and activities. It can also help in the program evaluation.

What programs are avai

(See insert for a display of the content included in each program.)

CATS (Critical Analysis and Thinking Skills) *(available through the National Diffusion Network - NDN)*

Terry Applegate, W. Keith Evans
CATS Program
4988 Kalani Drive
Salt Lake City, UT 84117-6421

Classroom Ideas for Encouraging Thinking and Feeling

DOK Publishers
71 Radcliffe Road
Buffalo, NY 14214

CoRT (Cognitive Research Trust) (deBono)

Pergamon Press, Inc.
Fairview Park
Elmsford, NY 10523

Creative Problem Solving

Creative Education Foundation
337 Franklin Street
Buffalo, NY 14202
or OK Publishers
7 Radcliffe Road
Buffalo, NY 14214

Critical Thinking 1, 2 (Harnadek)

Mid-west Publishers
P.O. Box 448
Pacific Grove, CA 93950

Future Problem Solving

Anne Crabbe
St. Andrews College
Laurenburg, NC 28352

Getting It Together

Opportunities for Learning
20417 Nordhoff Street
Department C
Clatsworth, CA 91311
or Center for Moral Education
Harvard Graduate School
322 Larsen Hall, Appian Way
Cambridge, MA 02138

Institute for Creative Thinking (NDN)

Verne Kelly/Monica Steinberg
Institute for Creative
Education Information and
Resource Center
Box 209 Route 4
Delea Drive
Sewell, NJ 08080

Instrumental Enrichment (Feurstein)

Curriculum Development
Associates, Inc.
Suite 414
1211 Connecticut Ave. NW
Washington, DC 20036

Intelligence Applied (Sternberg)

Harcourt Brace Jovanovich
7555 Caldwell Avenue
Chicago, IL 60648

Making It Strange, Making the Strange Familiar

SES Associates
121 Brattle Street
Cambridge, MA 02138

Moral Reasoning (Kohlberg)

Center for Moral Education
Harvard Graduate School of
Education
322 Larsen Hall, Appian Way
Cambridge, MA 02138

New Directions in Creativity

Creative Learning Press
Box 320
Mansfield Cntr, CT 06250
or Harper and Row
Keystone Industrial Park
Scranton, PA 18512

Odyssey

Mastery Education Corporation
85 Main Street
Watertown, MA 02172

Philosophy for Children (Lipman)

Institute for the Advancement of
Philosophy for Children
Montclair State College
Upper Montclair, NJ 07043

Components of Selected Programs

PROGRAMS / CONTENT	argument	communication	creativity	critical thinking	directions	decision making	language	logic	moral reasoning	organization	perception	planning	predicting	productive thinking	problem solving	questioning skills	reasoning	reference skills	relationships
CATS				X										X					
Classroom Ideas for Encouraging Thinking and Feeling			X																
CoRT			X	X		X					X	X			X				
Creative Problem Solving															X				
Critical Thinking 1, 2	X			X				X											
Future Problem Solving								X					X					X	
Getting It Together						X			X								X		
Institute for Creative Thinking															X				
Instrumental Enrichment					X					X		X					X		X
Intelligence Applied				X								X			X				
Making It Strange, Making the Strange Familiar			X												X				
Moral Reasoning									X										
New Directions in Creativity			X																
Odyssey			X			X			X						X		X		
Philosophy for Children				X				X											
Problem Solving and Comprehension															X				
Productive Thinking			X											X	X				
Project IMPACT				X															
Structure of Intellect					STRUCTURE OF INTELLECT SKILL CELLS														
TACTICS						X			X					X					X
Talents Unlimited			X	X		X				X		X		X	X		X		
Think About			X												X		X		
Willie the Wisher			X														X		

What are some resources and publications devoted to thinking?

FOUNDATION READING

Costa, Arthur, ed. *Developing Minds: A Resource Book for Teaching Thinking*. Roseville, CA: ASCD, 1985.

This is a comprehensive text dedicated to the need to teach students to think. A collaborative effort of contemporary cognitive educators, it provides an extensive resource for teaching thinking. It includes definitions, strategies, and programs for teaching thinking.

Marzano, Robert J., Ron Brandt, Carolyn Hughes, Beau Fly Jones, Barbara Presseisen, Stuart Rankin, and Charles Suhor. *Dimensions of Thinking*. Alexandria, VA: ASCD, 1987.

This book provides a synthesizing framework for the myriad of materials and approaches to thinking skills instruction. The framework includes skills, creative and critical thinking processes, and metacognition.

The authors summarize the history of the teaching of thinking and explain the "dimensions" mentioned in the introduction to this resource list. Topics include: skills of thinking, the processes of thinking, critical and creative thinking, the relationship of knowledge to thinking, the role of cognitive development in thinking, and the application of these dimensions.

Perkins, David N. *The Mind's Best Work*. Cambridge, MA: Harvard University Press, 1981.

This book explores the meaning of creating. Perkins examines the process of creating and what it is made of and theorizes about how creative people create by viewing the mind doing its best work. He offers scenarios of famous artists and scientists and poses activities that allow the reader to test his conclusions.

Presseisen, Barbara Z. *Critical Thinking and Thinking Skills: State of the Art Definitions and Practice in Public Schools*. Philadelphia, PA: Research for Better Schools, 1986.

Presseisen traces the critical thinking movement from its beginnings in the late 1930s, through the reforms of the 1960s, to the present day, focusing on the different perspectives that have evolved. Each definition of critical thinking has, Presseisen warns, "different messages for the classroom teacher." Her conclusion: without a common definition for critical thinking or agreement on how to improve students' intellectual functioning, the recent surge of interest from critical thinking advocates is unlikely to have any lasting influence in the classroom.

***Focus: Critical Thinking*. Educational Testing Service, 1984.**

This is a pamphlet useful for understanding the issues of critical thinking, including: why critical thinking is necessary, concern about its being simply a fad, a synopsis of selected programs, concerns about the impact of critical thinking, and who the audience for courses in critical thinking should be.

PERIODICALS

Cogitare -- newsletter of the Thinking Skills Network of ASCD
John Barrell
210 Chapin
Montclair State College
Upper Montclair, NJ 07043

CT News (Critical Thinking)
The Critical Thinking Project
The California State University
Sacramento, CA 95819

Teaching Thinking and Problem Solving
Lawrence Erlbaum Assoc., Inc.
365 Broadway
Hillsdale, NJ 07642

Informal Logic -- journal and newsletter
Department of Philosophy
University of Windsor
Windsor, Ontario N9b 3P4

Philosophy for Children Newsletter
The First Mountain Foundation
Box 196
Montclair, NJ 07042

Problem Solving
Franklin Institute Press
20th and Race Streets
Box 2266
Philadelphia, PA 19103

Thinking -- journal for the primary and elementary grades
IAPC Montclair State College
Upper Montclair, NJ 07042

Educational Leadership, April 1988.
This issue of *Educational Leadership* is devoted to articles about teaching thinking.

lable to teach thinking?

Problem Solving and Comprehension (Lockhead, Whimbey)

Franklin Institute Press
Box 2266
20th and Race Streets
Philadelphia, PA 19103

Productive Thinking

Charles Merrill Publishers
1300 Alum Center Drive
Columbus, OH 43216

Project IMPACT (Improving Minimal Proficiencies by Activating Critical Thinking) *(available through the National Diffusion Network-NDN)*

S. Lee Winocur
Project IMPACT
Orange County Dept. of Education
Costa Mesa, CA 92628-9050

Structures of Intellect

Structures of Intellect Institute
343 Richmond Street
El Segundo, CA 90245

TACTICS (Marzano, Arredondo)

ASCD
125 North West Street
Alexandria, VA 22314-2798

Talents Unlimited (NDN) *(available through the National Diffusion Network-NDN)*

Talents Unlimited
Arlington School
1107 Arlington Street
Mobile, AL 36605

Think About

Agency for Instructional Television
Box A
Bloomington, IN 47402

Willie the Wisher

Open Court Publishers
LaLasse, IL 61301

Additional information on several of the above programs, as elaborated by Chance, is provided below:

Chance, Paul. *Thinking in the Classroom: A Survey of Programs.* New York: Teachers College Press, 1985.

Thinking in the Classroom: A Survey of Programs thoroughly describes eight important curriculum programs and instructional strategies intended to develop thinking abilities:

- CoRT Thinking Lessons
- Instrumental Enrichment
- Productive Thinking Program
- Problem Solving and Comprehension
- Philosophy for Children
- Odyssey

Why teach thinking? How can thinking be taught?

Joyce, Bruce. "Models for Teaching Thinking." ***Educational Leadership*****, May, 1985.**

This article provides an insightful rationale for the implementation of the teaching of thinking and outlines the pervasive interdisciplinary approach. The author discusses "types of models " and emphasizes the importance of establishing a program that is used on a regular basis.

Marzano, Robert and C.L. Hutchins. ***Thinking Skills: A Conceptual Framework*****. Denver, CO: Mid-Continent Regional Educational Laboratory, 1985.**

This monograph describes the contribution to be made by teaching thinking skills in efforts to restructure education to produce students with skills needed to think effectively.

The authors divide the thinking skills into three areas: content thinking, reasoning, and learning-to-learn. Each area is described in depth. How schools need to change to incorporate these skills is discussed. Testing and evaluation changes are also considered. The importance of a "unitary approach" while modeling the reasoning skills is highlighted.

Halpern, D.F. ***Thought and Knowledge: An Introduction to Critical Thinking*****. Hillsdale, NJ: Erlbaum Associates, Inc., 1985.**

The research and theories of cognitive psychology are applied to the development of thinking skills in this introductory text. The influence of language on thought, strategies for problem solving, guidelines for valid reasoning, the nature of intelligence, and the promotion of creative thinking are among the topics covered.

Nickerson, R.S., N. Perkins, and E.E. Smith. ***Teaching Thinking*****. Hillsdale, NJ: Erlbaum Associates, Inc., 1985.**

What kinds of concepts, courses, and experiments are likely to enhance intellectual development? What teaching strategies can ease the transition from concrete to formal thinking? Can the function of education be designed to teach abstract thinking skills systematically? This book addresses these questions and many more to facilitate thought and discussion regarding the general objective: teaching thinking.

Perkins, David. ***Knowledge As Design*****. Hillsdale, NJ: Erlbaum Associates, Inc., 1986.**

The book offers an approach to readers for looking at knowledge in a different way -- instead of regarding knowledge as information to be recalled and used, Perkins suggests knowledge would serve us better if regarded as a design that has a structure suited to a purpose. This approach attempts to make knowledge more meaningful by connecting it to the contexts of applications and justification. Perkins suggests four questions that help the reader understand the nature of knowledge in the context of design. These can be applied to almost any "piece" of knowledge, e.g., Newton's laws, the Bill of Rights, etc: 1) What is its purpose? 2) What is its structure? 3) What are model cases? 4) What are arguments that explain and evaluate it?

Sternberg, Robert. "Teaching Critical Thinking, Part 1: Are We Making Critical Mistakes?" ***Phi Delta Kappan*****, November, 1985.**

The author's main point is that "what is required for critical thinking in adulthood and what school programs are doing to develop critical thinking have little relation to one another." He elaborates on ten differences between real-life problems and academic problems.

Sternberg, Robert. "Teaching Critical Thinking, Part 2: Possible Solutions." ***Phi Delta Kappan*****, December, 1985.**

The author has found that "the skillful application of thinking skills to one of these domains (academic or real-life) in no way insures their skillful application to the other." A range of programs is recommended. The author goes on to describe his program, "Intelligence Applied," which includes: 1) "meta-components," processes to plan, monitor, and evaluate problem solving; 2) performance components to carry out instructions; and 3) knowledge acquisition components that focus on how to solve problems. He emphasizes the need for teaching transfer from real-life to academic worlds and vice-versa.

deBono, Edward. ***Masterthinkers' Handbook*****. New York: International Center for Creative Thinking, 1985.**

This "how to" book on thinking focuses on developing active thinking skills using the CoRT Thinking program and a unique technique deBono calls "body frame thinking." Included in the book are thinking exercises, examples and diagrams to assist the reader in the development of his/her own thinking skills.

Videotapes about teaching for thinking

Teaching Skillful Thinking. This series of four videotapes produced by ASCD, includes a rationale and descriptions of various approaches to teaching thinking, alternating from views of experts to classroom demonstrations.

Tactics for Thinking. This set of videotapes proceeds step-by-step through twenty-two units -- one for each thinking tactic. These twenty-two units are grouped under the following headings:

Learning to Learn Skills
Content Thinking Skills
Reasoning Skills

Audience: Teachers of all grade levels and subject areas.

Both sets of video tapes are available from:

ASCD
125 N. West Street
Alexandria, VA 22314

If teachers and administrators want to use these new ideas, what can they learn from research about managing change and conducting effective staff development?

Loucks-Horsley, Susan and Leslie Hergert. *An Action Guide to School Improvement*. Andover, MA: The NETWORK, Inc., 1985.

This book describes a seven-step process for implementing new ideas in schools. Based on the findings of recent research, the steps range from initiating a project through planning for implementation through refining and maintaining it.

Loucks-Horsley, S., C. Harding, M. Arbuckle, L. Murray, C. Dubea, and M. Williams. *Continuing to Learn: A Guidebook for Teacher Development*. Andover, MA: The Regional Laboratory, 1987.

This book describes the characteristics of effective staff development programs and a process for developing them. It discusses twelve different approaches that are alternatives to traditional inservice workshops, illustrating how they can be used to help teachers learn new knowledge and skills.

Hord, Shirley, William Rutherford, Leslie Huling-Austin, and Gene Hall. *Taking Charge of Change*. Austin, TX: Southwest Educational Development Laboratory, 1987.

This book describes the Concerns-Based Adoption Model (CBAM), a model for understanding the change process and designing strategies for implementation. Each dimension of the model is discussed, with examples of how it looks in practice and tools for managing the change process.

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